WHAT IS CLAIMED IS:

1. A design-aiding device for a casting product, comprising:

analyzing means for analyzing solidification process based on temperature change of a melted material of the casting product in elapse of time in a three-dimensional model that corresponds to the casting product and is formed of a plurality of cells;

computing means for computing cell shrinkage porosity occurrence rates of the cells in the three-dimensional model from a result by the analyzing means;

converting means for stratifying the cell shrinkage porosity occurrence rates computed by the computing means and for converting the cell shrinkage porosity occurrence rates to specific gravity values; and

quantifying means for quantifying a region shrinkage porosity occurrence rate of a region that is to be evaluated regarding the region shrinkage porosity occurrence rate, by computing a volume with respect to each of the specific gravity values converted by the converting means, multiplying the computed volume by each of the specific gravity values to obtain a product, and then summing up, to obtain a sum, all the products corresponding to all the specific gravity values included in the region.

2. The design-aiding device for a casting product according to Claim 1,

wherein the computing means computes the cell shrinkage porosity occurrence rates with an equation where a temperature gradient of the melted material is divided by a square root of a cooling rate of the melted material.

3. The design-aiding device for a casting product according to Claim 2,

wherein the equation includes, as an initial condition, a supply-stopping temperature at which supply of the melted material is stopped, and

wherein the supply-stopping temperature is set based on a kind of the melted material.

4. The design-aiding device for a casting product according to Claim 1, further comprising:

strata setting means for setting a number of strata of the cell shrinkage porosity occurrence rates, wherein the converting means stratifies the cell shrinkage porosity occurrence rates into the strata.

5. The design-aiding device for a casting product according to Claim 1,

wherein the quantifying means quantifies the region shrinkage porosity occurrence rate as a region specific gravity value by dividing the sum by a volume of the region.

6. The design-aiding device for a casting product according to Claim 1,

wherein the region that is to be evaluated regarding the region shrinkage porosity occurrence rate is one of a plurality of regions into which the three-dimensional model is divided.

7. The design-aiding device for a casting product according to Claim 5, further comprising:

critical value setting means for setting a critical specific gravity value; and

determining means for determining whether the region specific gravity value is not greater than the critical specific gravity value set by the critical value setting means, and advising changing design when the region specific gravity value is determined to be not greater than the critical specific gravity value.

8. The design-aiding device for a casting product according to Claim 7,

wherein the critical value setting means sets the critical specific gravity value with respect to each of regions into which the three-dimensional model is divided.

9. The design-aiding device for a casting product according to Claim 1,

wherein the casting product includes a die-casting product using an alumina alloy.

10. A design-aiding method for a casting product, comprising:

analyzing solidification process based on temperature change of a melted material of the casting product in elapse of time in a three-dimensional model that corresponds to the casting product and is formed of a plurality of cells;

computing cell shrinkage porosity occurrence rates of the cells in the three-dimensional model from an analyzed result;

converting the cell shrinkage porosity occurrence rates to specific gravity values after stratifying the cell shrinkage porosity occurrence rates; and

quantifying a region shrinkage porosity occurrence rate of a region that is to be evaluated regarding the region shrinkage porosity occurrence rate, by computing a volume with respect to each of the specific gravity values, multiplying the computed volume by each of the specific gravity values to obtain a product, and then summing up, to obtain a sum, all the products corresponding to all the specific gravity values included in the region.

11. The design-aiding method for a casting product according to Claim 10,

wherein the cell shrinkage porosity occurrence rates of the cells are computed with an equation where a temperature gradient of the melted material is divided by a square root of a cooling rate of the melted material.

12. The design-aiding method for a casting product according to Claim 11,

wherein the equation includes, as an initial condition, a supply-stopping temperature at which supply of the melted material is stopped, and

wherein the supply-stopping temperature is set based on a kind of the melted material.

13. The design-aiding method for a casting product according to Claim 10, further comprising:

setting a number of strata of the cell shrinkage porosity occurrence rates, wherein the cell shrinkage porosity occurrence rates are stratified into the number of strata when the cell shrinkage porosity occurrence rates are stratified.

14. The design-aiding method for a casting product according to Claim 10,

wherein the region shrinkage porosity occurrence rate is quantified as a region specific gravity value by dividing the sum by a volume of the region.

15. The design-aiding method for a casting product according to Claim 10,

wherein the region that is to be evaluated regarding the region shrinkage porosity occurrence rate is one of a plurality of regions into which the three-dimensional model is divided.

16. The design-aiding method for a casting product according to Claim 14, further comprising:

setting a critical specific gravity value; and

determining whether the region specific gravity value is not greater than the critical specific gravity value, and advising changing design when the region specific gravity value is determined to be not greater than the critical specific gravity value.

17. The design-aiding method for a casting product according to Claim 16,

wherein the critical specific gravity value is set with respect to each of regions into which the three-dimensional model is divided.

18. The design-aiding method for a casting product according to Claim 10,

wherein the casting product includes a die-casting product using an alumina alloy.

19. A computer program product for executing design-aiding for a casting product, comprising:

analyzing solidification process based on temperature change of a melted material of the casting product in elapse of time in a three-dimensional model that corresponds to the casting product and is formed of a plurality of cells;

computing cell shrinkage porosity occurrence rates of the cells in the three-dimensional model from an analyzed result;

converting the cell shrinkage porosity occurrence rates to specific gravity values after stratifying the cell shrinkage porosity occurrence rates; and

quantifying a region shrinkage porosity occurrence rate of a region that is to be evaluated regarding the region shrinkage porosity occurrence rate, by computing a volume with respect to each of the specific gravity values, multiplying the computed volume by each of the specific gravity values to obtain a product, and then summing up, to obtain a sum, all the products corresponding to all the specific gravity values included in the region.